Who Holds Sovereign Debt and Why It Matters

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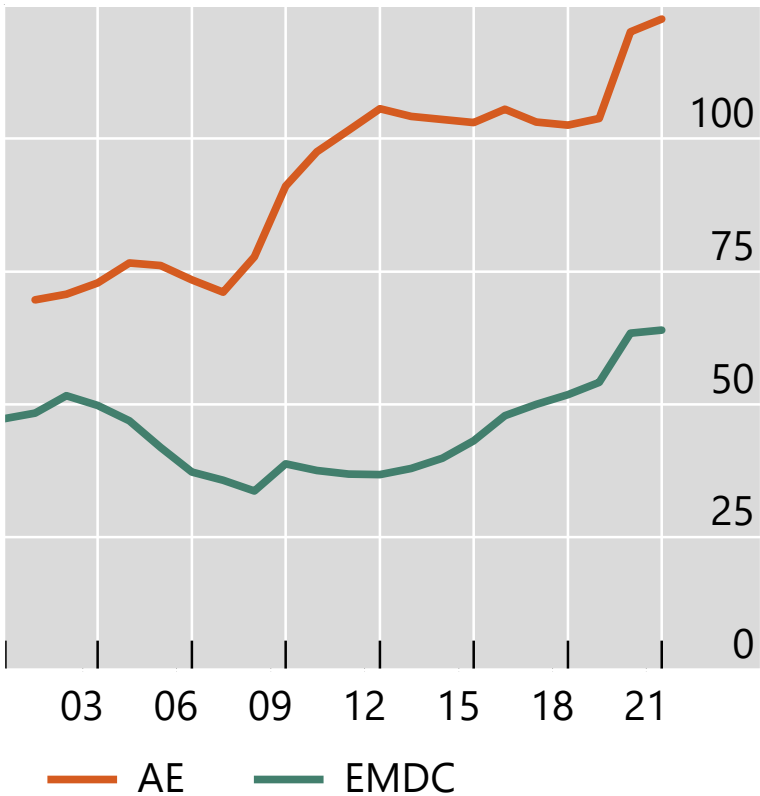
24 August 2022

Rising Sovereign Debt Raises Questions about Investors



Public Debt to GDP

- Government debt rising for all countries
- Who is holding this debt? How might this matter for the sovereign?

Presumed Sovereign Debt Investors in the Literature

Various strands of literature have emphasized different investors in sovereign debt

- **EM Sovereign default literature**
  - Eaton and Gersowitz (1981); Arellano (2008); Cruces and Trebesch (2013); Arellano and Ramanarayanan (2012); Mendoza and Yue (2012)
  - Focused mainly on foreign investors, particularly foreign banks
- **Bank-Sovereign Nexus ("Doom Loop") Literature**
  - Gennaioli, Martin and Rossi (2014); Bocola (2016); Farhi and Tirole (2018); Brunnermeier et al (2016)
  - Primarily domestic bank investors
- **FX Reserves Literature**
  - Ghosh, Ostry and Tsangarides (2017); Dominguez, Hashimoto, Ito (2012); Wooldridge (2006)
  - Foreign official investors

What we study

When a government needs to borrow, how does the composition of its investors affect its ability to raise funds (ie its borrowing costs)?

To answer, we need to understand:

- Who holds sovereign debt?
- When a government issues more debt, which investors pick it up?
- How responsive are investors to changes in the yield?

What we do

- **Construct a dataset** decomposing the outstanding sovereign debt into different investor types
  - Foreign vs Domestic, further split by Bank vs Non-Bank vs Official
  - Annual data, 1744 country-year observations spanning 95 countries over 1991-2018
- **Estimate the marginal share** for each investor group when the total debt changes
  - Accounting decomposition
  - Examine Euro Area data to unpack foreign non-banks
- **Estimate demand elasticity** for each investor group
  - Adapt Koijen-Yogo (2020) framework
- **Combine these estimates** to measure borrowing cost exposure of sovereigns to investor groups
  - Counterfactual: how much would yield rise without an investor group

What we find

- **Composition of investors changes over time**
  - Domestic investors expand in EMs, contract in AEs
- **Non-banks are the most "marginal"**
  - Pick up \$0.69 of every \$1 increase in sovereign debt
  - Most important entity within Non-banks: investment funds
- **Foreign non-banks are the most price elastic investors for EM sovereigns**
  - Elasticity wrt yield of 1.68
- **Investor exposure of EM sovereigns is largest to (losing) foreign non-banks**
  - Debt cost increases by 17% (eg 10% rate rises to 11.7%)

Outline

1. Data
2. Marginal Investors
   - Euro area data
3. Demand framework and yield elasticity
4. Investor exposure and counterfactual
5. Conclusion

1.Data Structure

- Total government debt for country j : D_j
- Total investor holdings for country j of investor group i : H_j^i
- For foreign and domestic investors, investors separated into three main groups
  - Private Banks
  - Private "Non-banks"
  - Official (Central Banks, IMF,etc)
    - Similar to Arslanalp and Tsuda (2012, 2014)
- Therefore, total investor groups: $I = 6$
- Accounting Identity at time t

$$D_{j,t} = \sum_{i=1}^{I} H_{j,t}^i$$

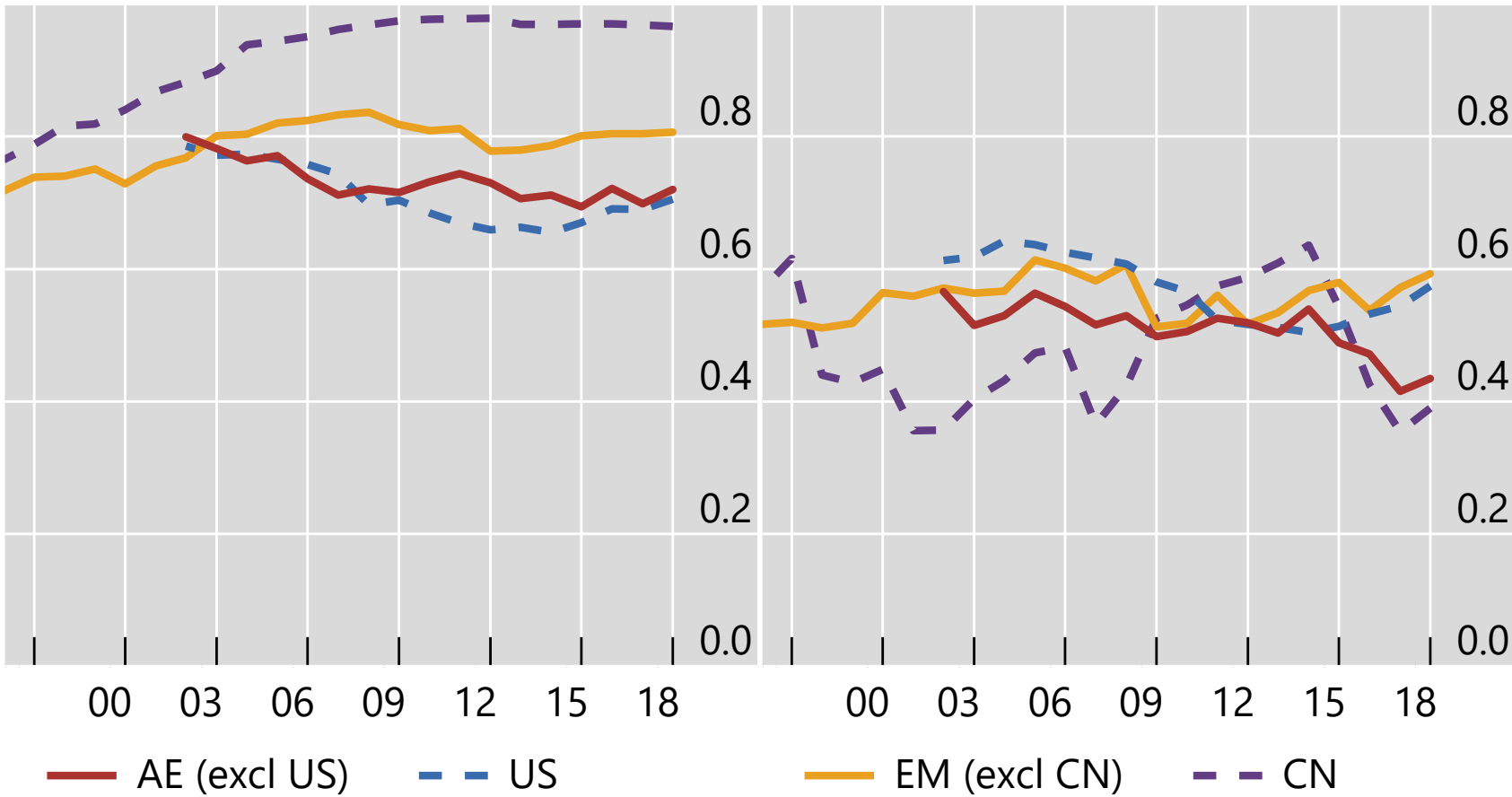
1.Data Construction

- Data construction is aggregate top down
  - Start with total debt outstanding (IMF HPDD)
  - Data on domestic bank and central bank holdings (IMF)
  - Data on external holdings and external bank holdings (Avdjiev et al (forthcoming) - BIS, IIP, QEDS)
  - Data on foreign official holdings
    - Advanced + China: Reserve holding estimates from Arslanalp and Tsuda (2012,2014)
    - Other EM + Developing: World Bank data on bilateral/multilateral lending
  - Compute other categories as residuals (Total - Foreign = Domestic; Foreign - ForBank - ForOff = ForNB; etc.)

End result: 1744 country-year observations with full decomposition, spanning 95 countries over 1991-2018

2. Debt Holder Decomposition

Composition changes over time



Domestic share

Non-bank share

2. Who Holds Marginal Increases in Sovereign Debt?

$$\frac{H^i_{j,t} - H^i_{j,t-1}}{D_{j,t-1}} = \alpha_j + \alpha_t + \beta^i_0 \frac{D_{j,t} - D_{j,t-1}}{D_{j,t-1}} + \varepsilon^i_{j,t}$$

- $H^i_{j,t}$ holding of country j's debt by investor group i
- $D_{j,t}$ is the total debt of country j

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	Dom	For	DomB	DomNB	DomCB	ForB	ForNB	ForCB
All	0.60	0.40	0.16	0.39	0.05	0.04	0.30	0.06
AE	0.50	0.50	0.02	0.39	0.09	0.06	0.40	0.04
EM	0.68	0.32	0.21	0.43	0.04	0.05	0.24	0.04
DC	0.50	0.50	0.11	0.34	0.05	0.01	0.40	0.09

- When the total sovereign debt increases by 1 unit
  - Non-banks pick up 69% of the increase, despite accounting for 46% of the holdings

2. Investor Decomposition Takeaways

- Non-bank investors absorb largest share
- Banks absorb much less (20% compared to 40% of holdings)
  - demand driven more by regulatory and liquidity needs, not investment opportunity?
- Compared to standard literature
  - suggests greater role for Non-bank investors

2b. Disaggregating Non-banks in the Euro Area

- "Non-banks" -Large group including many investor types
  - Insurance and Pensions
  - Investment Funds (eg Hedge funds, mutual funds)
  - Private Non-Financial Corporations
  - Households

- Question: Which ones drive aggregate Non-bank behavior?
- To address - Analyze disaggregated EA securities holding data
  - Quarterly from 2013 to 2020, focus on foreign investment only (ie outside EA)
  - Repeat early decomposition disaggregating Non-bank change in holdings

2b. Which Non-banks are Marginal?

	HH	NFC	InsurPens	OthFin
All	0.01	0.00	0.14	0.85
AE	0.02	0.01	0.12	0.85
EM	0.01	0.00	0.14	0.85

- Within Non-banks, Hedge Funds and Mutual Funds account for 85% of marginal increase in holdings of non-bank investors
  - Insurance and Pensions account for 14%

3. Determining Investor Demand for Sovereign Debt

- Have in mind a two-step model:
  - Investors allocate part of overall portfolio to sovereign debt
  - Investors allocate sovereign debt portfolio amongst sovereigns

- Condense this to the following regression:

$$\frac{H^i_{jt}}{Y_{jt}} = \beta^i_0 + \beta^i_1 \ln y_{jt} + (\gamma^i)' X_{jt} + \theta^i_j + \theta^i_t + \epsilon^i_{jt}$$

  where y is the 5-year local currency bond yield, X is a vector of country-specific controls, and θ's are time and country fixed effects.

- Problem: yield is endogenous to demand

3. IV for yield

- We adapt Koijen-Yogo (2020)
- Rather than the full decomposition of the investor's portfolio, we have the full decomposition of the borrower's investors
- Proceed in 3 steps:
  1. Compute ex-post market value: $H_{jt}^{i,m} = H_{jt}^{i}/(1+y_{jt})^{T}$
  2. Estimate market value of demand for holdings:

$$ln\frac{H_{jt}^{i,m}}{Y_{jt}} = \alpha_j + \alpha_t + \alpha_1 X_{jt} + u_{jt}^{i}$$

  3. Take fitted values and solve for the yield that clears the market

$$\sum_{i=1}^{I} exp\left(\widehat{\ln\frac{H_{jt}^{i,m}}{Y_{jt}}}\right) = \frac{D_{jt}}{Y_{jt}(1+\bar{y_{jt}})^{T}}$$

- $\bar{y_{jt}}$ is relevant (1st Stage F-stat over 20) and plausibly exogenous (constructed from factors exogenous to the investor)

3. IV Results: Emerging Markets

	(1) Dom Bank	(2) Dom NB	(3) Dom CB	(4) For Bank	(5) For NB	(6) For Off
Sovereign yield	0.08***	0.09***	0.02**	0.01*	0.11***	0.06***
	(0.02)	(0.03)	(0.01)	(0.01)	(0.03)	(0.02)
Observations	339	339	339	339	339	339
$\frac{H^i_{jt}}{Y_{jt}}$	0.13	0.16	0.03	0.02	0.07	0.07
Elasticity	0.64	0.60	0.83	0.50	1.68	0.81

Note: Country Controls include GDP growth, inflation, export-to-GDP, depreciation, LC share of international debt.

- Higher EM yields attract all investors, but at different rates
- Non-banks' holdings increase the most with yield
- Elasticity wrt yield highest for foreign non-banks

4. Counterfactual Exposures Analysis

- What is the borrowing cost exposure for sovereigns given their investors?
  - Exposure (δ) = % change in borrowing costs for % change in debt

$$D_{jt}P_{jt} = \sum_{i=1}^{I} H_{jt}^{i} P_{j}^{i}(H_{jt}^{i})$$

- Rewrite $P_{jt}^{i} = 1/(1+y_{jt})^{T}$, and differentiate wrt y:

$$\delta_{jt} \equiv \frac{\partial y_{jt}/y_{jt}}{\partial D_{jt}/D_{jt}} = \sum_{i=1}^{I} \left(\frac{\partial y_{jt}^{i}/y_{jt}^{i}}{\partial D_{jt}/D_{jt}} \right) \frac{dH_{j}^{i}}{dD_{j}} = \sum_{i=1}^{I} \left(\frac{a_{j}^{i}}{\eta_{j}^{i}} \right)$$

- where a_{j}^{i} is the marginal absorption of investor i and η_{j}^{i} is their demand elasticity
- Hence, exposure is a weighted average of the inverse demand elasticity (with weights determined by marginal absorption shares)

4. Emerging markets: Counterfactual Results

- Overall $\delta = 1.38 \rightarrow$ borrowing costs rise by 1.38% for every 1% increase in debt
- Excluding non-banks, this rises to 1.54

Exposures:	DomBank	DomNB	DomCB	ForBank	ForNB	ForOff
Only this Investor	1.56	1.66	1.21	2.00	0.60	1.23
Excluding this investor	1.32	1.15	1.37	1.33	1.61	1.37
Absorption	0.21	0.43	0.04	0.05	0.24	0.04

- EM countries most exposed to (losing) foreign Non-bank investors

5. Conclusions

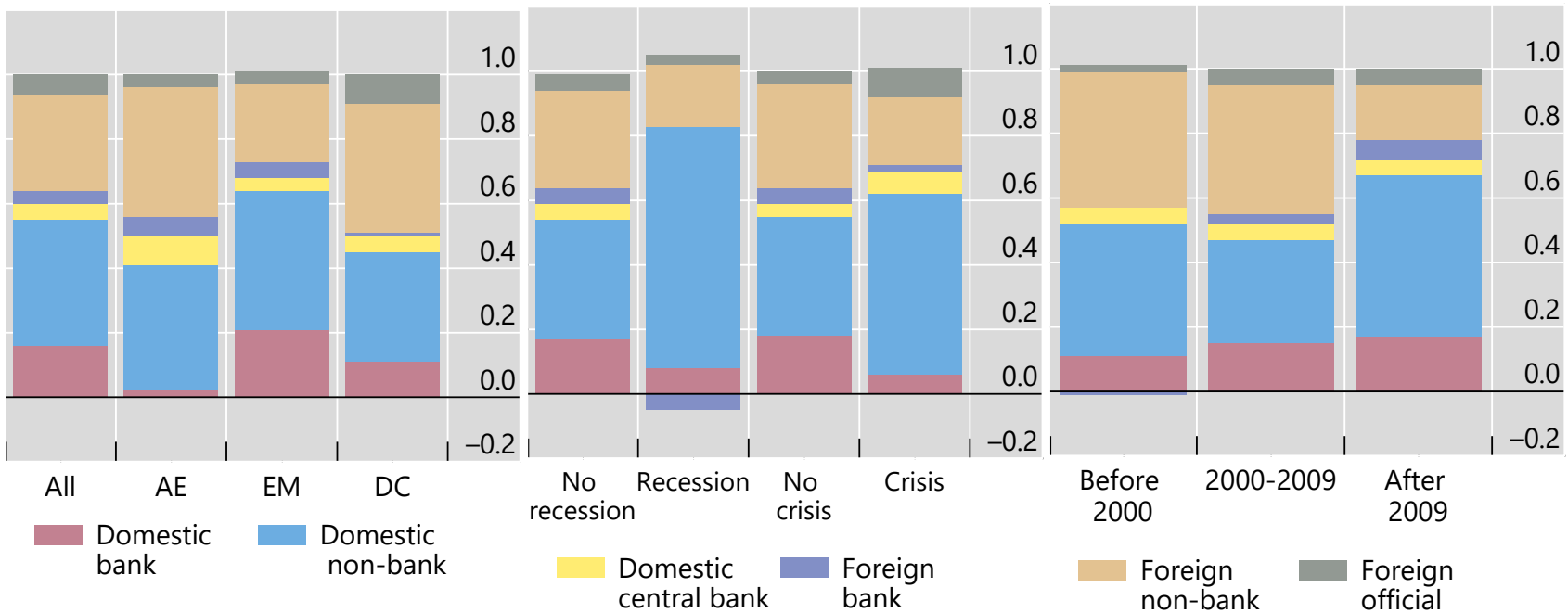
- Documented Who Holds Sovereign Debt
- Expansions largely absorbed by private Non-banks → mostly investment funds
- Investor demand for EMs most elastic by foreign Non-banks
- EMs have high exposure to investors
  - Greatest contribution from foreign Non-banks
- Therefore, Who Holds Sovereign Debt Matters

5. Further thoughts

- Doom-loop literature may want to incorporate non-banks
  - How large/concentrated are NBFI positions on sovereigns?
  - What additional exposure do banks have to sovereigns via the NBFIs that they lend to or receive funding from?
  - Ex: domestic banks reliant on wholesale funding from NBFIs with extremely leveraged sovereign positions → funding shock for banks if sovereign risk rises
- Covid may be a unique case
  - Sharp increase + monetary accommodation + prudential relaxation → most picked up by CBs and in some cases Dom Banks
- More research needed on this topic

Appendix

2. Marginal Investors by period



- Role of different investors can change with circumstance